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8. Category 2 Hazardous Materials

8.1 Introduction

LLNL has established policies to mitigate the risks from hazardous materials. This Section provides LLNL's containment, communication, and control policies and implementation requirements for onsite handling and transport of Category 2 Hazardous Materials. At LLNL most Category 2 Hazardous Materials consist of hazardous, radioactive, or mixed waste. See **Section 8.4** for a description of Category 2 Hazardous Materials.

This Section identifies organizational responsibility and the hazards associated with the primary types of Category 2 Hazardous Materials at LLNL. **Section 7** provides those requirements for Category 1 Hazardous Materials, and **Section 9** provides them for Category 3 Hazardous Materials

8.2 Accountability

Hazardous Waste Management Division

The Hazardous Waste Management (HWM) Division has the responsibility and authority for providing guidance to waste generators on packaging Category 2 Hazardous Materials, and for transferring wastes generated at HWM Division facilities.

HWM Division treats, packages, and prepares for shipment hazardous, transuranic (TRU), low-level (LLW) radioactive, and mixed wastes.

Category 2 Hazardous Materials that are transferred to HWM Division or transferred between HWM Division facilities may be liquid or solid. Gas cylinders containing residual hazardous materials identified as hazardous waste are also handled by HWM Division. Explosive wastes may be shipped directly to an offsite commercial TSDF.

Explosives as an Exception

Explosives and explosives wastes are not handled routinely by HWM Division. Explosives wastes are considered Category 1 Hazardous Materials and are to be managed according to the policies and controls specified in **Section 7.5** of this document. HWM Division prepares

shipping manifests for explosive waste shipments offsite.

8. 3 HWM Division Facilities

Description of HWM's Main Site Facilities

There are four active HWM Division facilities at the Main Site (a fifth facility, Building 419 Facility, is inactive and currently used for office space and/or non-waste storage):

- Building 233
- Area 514 Facility
- Area 612 Facility
- Building 693 Facility.

The Area 514 Facility and the Area 612 Facility include a total of 30 waste management units where hazardous, radioactive, and mixed waste is stored and treated. Area 514 contains processing equipment and storage areas for radioactive liquids. Area 612 has solid radioactive waste processing equipment and storage for radioactive wastes. Radioactive, hazardous, and mixed wastes are also treated and/or stored at Building 233. Building 625 is the primary storage location for TRU mixed waste. Hazardous wastes are also processed in the Building 693.

HWM's Waste Handling Operations

The following waste handling operations are performed at HWM Division facilities:

- LLNL Building 513—Shredder/Solidification/Waste Storage
- LLNL Building 514—Liquid Waste Treatment
- LLNL Building 612—Receiving/Segregation/Drum Storage/Container Crushing
- LLNL Building 614—Eight-Cell Storage for Hazardous Wastes
- LLNL Building 625—PCB, TRU, Asbestos Waste Storage
- LLNL Building 693—Chemical Waste Storage.

Description of HWM's Site 300 Facility

HWM Division also has a Site 300 facility, a covered container storage area adjacent to Building 883. This Treatment, Storage, and Distribution Facility (TSDF) facility is primarily used to hold hazardous waste before it

is transferred to Main Site.

8.4 Identification and Hazards of Category 2 Hazardous Materials

This section below provides more information on the hazards associated with various types of Category 2 Hazardous Materials.

Types of Category 2 Hazardous Materials

Category 2 Hazardous Materials can be hazardous, radioactive, or mixed (radioactive and hazardous). Category 2 Hazardous Materials include solid and liquid hazardous, radioactive, and mixed wastes; pressurized gases; hazardous waste samples; and sludge and liquid from wastewater retention tanks. **Table 8-1** identifies LLNL waste streams that require routine chemical and radiological analyses to monitor specific contaminants, components, and characteristics of Category 2 Hazardous Materials.

Table 8-1. Waste streams containing Category 2 Hazardous Materials

Waste Stream	Category 2 Hazardous Material
Acids and Bases	pH, normality
Plating or Heavy Metal Solutions	Metal concentrations; Cyanides, where cyanides are being used
Non-chlorinated or Mixed Organic Solvents	Flash point; Volatile Halocarbon Solvents
Oils	Volatile Halocarbon Solvents; PCBs; Percent Oil or Water; Flash point (if volatile components)
Coolants	Volatile Halocarbon Solvents; Percent Oil; Metal contaminants
Radioactive Materials	Curies or grams of radioactive material
Solid Wastes and Sludges	Extraction test for metals

Hazardous Solid and Liquid Wastes

Hazardous wastes are those listed by:

- EPA

- California Department of Toxic Substances Control (DTSC).

Hazardous liquid and solid wastes are nonradioactive, but may be characterized as carcinogenic, toxic, poisonous, corrosive, reactive, flammable, or ignitable.

Solid and Liquid Low-Level Radioactive Wastes

The types of radionuclides handled at LLNL are numerous and the associated activity varies.

Radioactive wastes are those waste materials with that contain radioactivity, as defined by the LLNL document, *Criteria and Procedures for the Certification of Non-Radioactive Hazardous Wastes*.

Transuranic Wastes

The radionuclides present in TRU waste vary; however, by volume, 95% is contaminated primarily by plutonium isotopes. The remaining 5%, by volume, is contaminated by (but not limited to) Am-241, Np-237, Cm-244, Cm-248, Cf-250, Cf-252, and fission products.

Mixed Wastes

Mixed wastes are wastes that are both radioactive and contaminated with nonradioactive hazardous wastes. Mixed wastes can be liquid or solid. They may also be carcinogenic, toxic, corrosive, reactive, pyrophoric, or ignitable; and they may be held in pressurized containers.

Pressurized Gas Cylinders

Pressurized gases can be flammable, toxic, corrosive, reactive, or cryogenic. A small spill can produce a large volume of gas which can displace air in a confined space.

Hazardous Waste Samples

Hazardous waste samples are taken by the waste generators at the waste generation sites. They are transferred to the onsite Environmental Analytical Sciences Laboratory for analysis. Hazardous waste samples are typically corrosive liquids, aqueous/organic liquids, contaminated oils, polychlorinated biphenyl- (PCB-) contaminated oils, aqueous liquids contaminated with metals and/or organics, coolants, solids, sludges, and unknown substances. They may be either radioactive or nonradioactive.

Samples are considered low hazard because of the small quantity of material present and adherence to strict chain-of-custody procedures. See **Section 8.10** for the policies and implementation requirements concerning hazardous waste samples.

Liquid Waste Retention Tank

Above-ground retention tanks are used throughout the Main Site and Site 300 to collect large volumes of wastewater. This wastewater may contain constituents that exceed sanitary sewer discharge limits. Retention tank wastewaters are analyzed to determine whether they can be discharged to the sanitary sewer, either directly or after pH adjustment, or whether they must be disposed of as hazardous waste.

8.5 Waste Generator's Responsibilities in Packaging and Transferring Category 2 Hazardous Materials

This section describes the responsibilities of the waste generator to package and palletize hazardous waste for onsite transfer to an HWM facility.

Waste generators are programmatic personnel, researchers, and other users who generate hazardous waste as a byproduct of their activities. They are responsible for packaging their Category 2 Hazardous Materials, taking samples, having the samples analyzed, placing the containers on pallets, and transferring the pallets to a WAA. Their responsibilities in these tasks is described below.

Packaging Hazardous Waste for Transfer

Waste generators are responsible for packaging Category 2 Hazardous Materials for onsite transfer to HWM Division facilities. The waste generator must:

- Plan ahead for waste disposal by considering other options, such as recycling, re-use, waste minimization, on-line treatment, and material substitution
- Determine the waste type, i.e., hazardous, radioactive, or mixed
- Segregate the wastes as they are generated to prevent mixing incompatible materials or wastes that are difficult to dispose of
- Package wastes in containers approved for transfer by HWM Division
- Provide proper identification of the waste package contents
- Separate incompatible waste packages from each other and separate radioactive waste packages from nonradioactive waste packages in the process areas

- Obtain samples of the hazardous waste and have them analyzed before the wastes are picked up by HWM Division
- Place waste packages on pallets and prepare waste packages for transfer according to waste generator and WAA guidelines.

Placing Waste Containers on Pallets

Packages of Category 2 Hazardous Materials must be delivered to the WAAs secured on pallets. Waste generators are required to:

- Place packages of chemically incompatible materials on separate pallets. Compatibility requirements are outlined in "The Preparation Guide for Generators of Hazardous Chemicals and Radioactive Waste at LLNL" in the *Environmental Protection Department Handbook*
- Separate pressurized materials from other hazardous wastes and overpack or individually secure them to a pallet
- Place waste containers of 209 L (55 gal) or smaller on pallets that can be loaded by forklift onto a flatbed truck. These pallets must be in serviceable condition with no breaks, loose boards, or lifting nails
- Limit the load per container. Drums shall not weigh more than 430 kg (750 lb). Other containers shall not exceed design limits
- Limit the load per pallet. No wooden pallet shall be loaded with more than two full drums of liquid, three full drums of solid waste, or four empty drums. No PDQ-manufactured plastic pallet shall be loaded with more than four drums or exceed 1,357 kg (3,000 lb)
- Distribute the load on each pallet. **Note:** Stacking should be avoided and is prohibited for 18-L (5-gal) cans and cardboard boxes more than two high.
- Load each pallet in such manner that waste labels are visible
- Strap or tape all containers together on the pallet
- Check to ensure that all containers on the pallets are approved for pickup by HWM Division
- Inspect all containers to ensure that:
  - None is leaking or unserviceable
  - All caps and bungs are sealed tightly
  - There is no waste spillage or contamination on the sides of the container
  - The containers show no evidence of swelling
  - Containers of liquid have adequate head space
  - Boxes are secured and undamaged

- Overpack damaged packages
- Ensure pallets are accessible to forklifts
- Deliver the palletized waste to the WAA located near the waste generating facility.

Waste Pickup and Onsite Transfers

WAAs are located at or near the waste generation site. Hazardous waste that has been properly segregated, identified, and packaged may be stored in a WAA for up to 90 days. Within that period of time, the waste is removed by HWM Division for storage, treatment, and/or disposal.

For More Information

Guidance on the responsibilities of the waste generator is found in:

- *Guidelines for Waste Accumulation Areas*
- *The Preparation Guide for Generators of Hazardous Chemicals and Radioactive Waste at LLNL" from the Environmental Protection Department Handbook*
- HWM Division's waste acceptance criteria (WAC).

Training requirements for waste generators are described in **Section 11**.

For more information and guidance on packaging of Category 2 Hazardous Materials, waste generators can contact Field Hazardous Waste Technicians from HWM Division, and Environmental Analysts from the Operations and Regulatory Affairs Division (ORAD).

8.6 Transport of Category 2 Hazardous Materials

This section provides requirements for the transport of Category 2 Hazardous Materials at Site 300, Main Site, and between LLNL facilities.

Waste Transport and Schedule at Main Site

At the Main Site, hazardous wastes are transported from waste generating sites to waste management facilities by HWM Division personnel in HWM Division vehicles once per week on the hazardous waste run.

Transfers between HWM Division's Main Site Facilities

Category 2 Hazardous Materials received at Area 612 can be transferred by HWM Division in HWM Division vehicles to Area 514 for waste treatment.

Category 2 Hazardous Materials treated at Area 514 can be transferred by HWM Division in HWM Division vehicles to Area 612 for preparation for offsite shipment or to Buildings 612, 614, 625, and 693 for storage.

Waste Transport at Site 300

At Site 300, hazardous wastes are transported from the waste generating sites to the Site 300 Treatment, Storage, and Distribution Facility (TSDF) by HWM Division personnel in HWM Division vehicles on a request basis.

Wastes located at a WAA within 500 feet of the TSDF are transported to the TSDF by HWM Division in forklifts.

Waste Transport from Site 300

Category 2 Hazardous Materials are shipped from the TSDF to HWM Division facilities at the Main Site or to other offsite licensed disposal facilities.

Caution: Category 2 Hazardous Materials shipped from Site 300 to the Main Site are shipped over public roads and, therefore, must meet DOT requirements.

8.7 Containment Policy and Implementation Requirements for Category 2 Hazardous Materials

This section provides containment policy and implementation requirements for Category 2 Hazardous Materials.

Containment Policy for Category 2 Materials

Radiological hazards are controlled through the use of proper packaging and containment to limit personnel exposures to levels that are ALARA.

Containment Requirements for Category 2 Hazardous Materials

Containment requirements for Category 2 Hazardous Materials at LLNL Main Site are delineated in *The Preparation Guide for Generators of Hazardous Chemicals and Radioactive Waste at LLNL* in the *LLNL Health and Safety Manual*. Containment requirements for Site 300 are delineated in the *Site 300 Safety and Operational Manual,* Procedures # 404 and 406. HWM Division's waste acceptance criteria also provides containment requirements for Category 2 Hazardous Materials

Containment Requirements for Radioactive Materials

Radioactive materials are packaged onsite in DOT, NRC, DOE, or LLNL-approved containers with following restrictions:

- To protect from an accidental nuclear criticality, the combination of fissile materials at an HWM Division facility shall not exceed 120 g in each 55-gal drum
- For fissile materials stored in containers other than 55-gal drums, any combination of 233U, 235U, and 239U at an HWM facility (Area 612 Facility) must not exceed 120 g aggregate total.

Containment Requirements for Pressure Vessels and Cylinders

Pressure vessels and cylinders are managed under the Hazards Control pressure safety program as described in the *LLNL Health and Safety Manual*, Chapter 32. Waste gases are transported in cylinders adequately tied down to the transport vehicle.

Transport of Liquid Waste

Nonsewerable wastes are pumped from the retention tanks to portable containers and placed in the WAAs. Large volumes of wastes are pumped into tanks. HWM flatbed trucks transfer the tanks directly to HWM Division facilities for treatment or shipment preparation, or the wastes are shipped directly offsite.

8.8 Communication Policy and Implementation Requirements for Category 2 Hazardous Materials

This section provides the communications policy and requirements for Category 2 Hazardous Materials, including required placards on transport vehicles and container labels.

Communication Policy for Category 2 Materials

Category 2 Hazardous Materials must be packaged, labeled, and marked in conformance with DOT requirements.

Communication Requirements for Category 2 Materials

Waste disposal requisitions are reviewed for adequacy by HWM Division prior to waste pickup and transfer.

Waste run vehicles transporting hazardous wastes are placarded with DOT

"Dangerous" placards.

Labeling Requirements for Category 2 Materials

Containers of Category 2 Hazardous Materials must also be clearly labeled as follows:

Low-Level Radioactive Waste (LLW) Labels: At the Main Site and at Site 300, LLW containers are identified with Radioactive Waste Labels. A Waste Disposal Requisition must accompany the transfer.

Transuranic (TRU) WasteLabels: At the Main Site and at Site 300, TRU containers are identified with Radioactive Waste Labels. A Waste Disposal Requisition must accompany the transfer.

Hazardous Waste Labels At Main Site and Site 300, Category 2 Hazardous Material containers are identified with Hazardous Waste Labels. An LLNL Hazardous Waste Disposal Requisition must also accompany the transfer. **Note:** If the waste contains a material listed in Appendix A-1 of the *LLNL Health and Safety Manual*, Supplement 21.16 ("Safe Handling of Carcinogenic Substances"), a "Danger—Chemical Carcinogen" label must also be affixed to the waste container.

Retention Tank Waste Labels: The Hazardous Waste Retention Tanks are labeled with the same label as hazardous waste containers.

Mixed Waste Labels: At the Main Site and at Site 300, mixed waste containers are identified with Mixed Waste Labels. An LLNL Waste Disposal Requisition or a TRU Waste Requisition must accompany transfers of mixed wastes. **Note:** If the waste contains a material listed in Appendix A-1 of the *LLNL Health and Safety Manual*, Supplement 21.16 ("Safe Handling of Carcinogenic Substances"), a "Danger—Chemical Carcinogen" label must also be affixed to the waste container.

Pressurized Gas CylinderLabels: At the Main Site and at Site 300, Category 2 Hazardous Material containers are identified with Hazardous Waste Labels. An LLNL Hazardous Waste Disposal Requisition must also accompany the transfer. **Note:** If the waste contains a material listed in Appendix A-1 of the *LLNL Health and Safety Manual*, Supplement 21.16 ("Safe Handling of Carcinogenic Substances"), a "Danger—Chemical Carcinogen" label must also be affixed to the waste container.

8.9 Control Policy and Implementation Requirements for Category 2 Hazardous Materials

This section provides the control policy and requirements for Category 2 Hazardous Materials, including personnel authorized to handle and transport Category 2 Materials, transport conditions, limitations, and constraints.

Control Policy for Category 2 Materials

The use of trained and qualified material handlers and HWM Division personnel greatly reduces the probability of personnel error that could lead to accidents.

Control Requirements for Category 2 Materials

The following administrative and/or physical controls are in effect to mitigate risk during onsite transport:

- Packages shall not be lifted or transported higher than 4 ft above the ground, unless authorized.
- LLNL employees who generate hazardous or radioactive waste must complete the required EPD training for these activities.
- Waste requisitions are reviewed by HWM Division prior to pick up on the waste run.
- An HWM Division technician accompanies the HWM Division driver on the waste run.
- The HWM Division technician inspects all packages prior to transport to HWM Division facilities.
- Wastes are segregated for chemical compatibility on the truck bed, according to OSP 530.
- Drivers must not exceed a 40-km/hr (25-mph) speed limit at LLNL and a 56-km/hr (35-mph) speed limit at Site 300 while transferring Category 2 Hazardous Materials.
- The LLNL Fire Department must be able to respond to any emergency at the Main Site within 3 minutes.
- The LLNL Fire Department must be able to respond to any emergency at Site 300 within 15 minutes.

8.10 Containment, Communication, and Control Policies and Implementation Requirements for Hazardous Waste Samples

This section provides containment, communication, and control policies and requirements for hazardous waste samples.

Containment Policy for Hazardous Waste Samples

Hazards associated with hazardous waste samples are controlled through the use of proper packaging and containment to limit personnel exposures to levels that are ALARA.

Containment Requirements for Hazardous Waste Samples

Hazardous waste samples are packaged as follows:

- Waste samples are collected in sample bottles appropriate for the sample type.
- The bottles are placed in either a plastic bottle carrier, an ice chest, or a plastic tray with foam spacers.
- Individual samples may be transported to the analytical laboratory in ziplock polyethylene bags.

Communication Policy for Hazardous Waste Samples

Hazardous waste samples are packaged, labeled, and marked in conformance with DOT requirements.

Communication Requirements for Hazardous Waste Samples

During onsite transfers of hazardous waste samples, the following requirements are in effect:

- The waste generator is required to submit a HWM Control Laboratory Analysis Request form and/or a Hazards Control Radioactivity Sampling Record Form (which contains sample identity data) to the analytical laboratory.
- Sample numbers which correspond to a sample log are written on each sample bottle, as well as the sample date and location.
- An Analytical Sample Custody Record form accompanies the transfer.

Control Policy for

The use of trained and qualified material handlers greatly reduces the

Hazardous Waste Samples	probability of personnel error that could lead to an accident.
Control Requirements for Hazardous Waste Samples	Waste samples are controlled by a strict chain-of-custody procedure entitled HWM Division-402, Analytical Sample Custody Procedure.

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